A COMPARISON OF METHODS FOR COMPUTING DAILY MEAN VALUES OF DRY BULB TEMPERATURE, DEW POINT, AND RELATIVE HUMIDITY

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ABSTRACT

This study compares several methods of computing daily mean values of dry bulb temperature, dew point, and relative humidity. Data are daily observations at nine selected points in the contiguous United States for 5 years of record during the mid-season months of January, April, July, and October. Daily mean values of the three elements were computed from the four synoptic observations (sum÷4) and from the 24 hourly observations (sum÷24). Also, for dry bulb temperature and dew point, they were computed from the daily highest and lowest hourly value (sum÷2). With the mean of the 24 hourly values as the base, daily departures of the means computed by the other methods were determined. Averages and standard deviations of these daily departures were computed for each station-month for the 5-year period. These were mutually compared, with the conclusion that when the methods tested are applied to dew point and relative humidity, the departures from the 24-hour mean are generally no larger, and in many cases are smaller, than those obtained in computing daily mean dry bulb temperature by the same method.

1. INTRODUCTION

A new format for the Weather Bureau's *Local Climatological Data (Supplement)* was introduced with the issue dated January 1961. Table G of the new format lists daily values of 24-hour averages of several elements including dry bulb temperature, dew point temperature, and relative humidity. These values are computed by adding the 24 values entered at each record hourly observation and dividing the sum by 24. This source makes daily 24-hour means of these elements available from over 200 Weather Bureau stations in the United States. At most of the same stations, daily values of mean temperature obtained by the usual method of taking one-half the sum of the maximum and minimum are published in the corresponding *Local Climatological Data*.

Decision to publish these new data was, in part, in response to the growing interest in and demand for daily mean values of dew point and relative humidity. Much of this demand comes from agronomists and hydrologists who are interested in computing evaporation and evapotransipiration [1, 2, 3]. The published data will be useful but the number of stations and periods of record for which they are available are limited. For studies or investigations involving other stations or locations or periods of record it will be necessary to use daily mean values based on the mean of the maximum and minimum or the mean of the four "synoptic" observations. Van Bavel and Verlinden [2] use mean relative humidity from the four synoptic observations (one every six hours). Newman, Shaw, and Suomi [3] propose simple instrumentation to obtain daily maximum and minimum dew point temperatures at agrometeorological observing stations.

A great deal has been written about the relative merits of computing daily mean temperatures according to various formulas [4, 5, 6]. However, the question of computing daily mean values of dew point or relative humidity has not been similarly treated. The purpose of this present study is to compare several common methods of computing such daily means as they apply to dew point and relative humidity.

2. DATA USED

Nine stations in the contiguous United States were selected for this study. Data for the mid-month of each season (January, April, July, October) were processed for five years of record (1955–1959). The following computations were made for each day of the five years for each station month:

(1) Dry bulb temperature (° F.).
  a. daily mean of 24 hourly values (sum÷24).
  b. daily mean of 4 "synoptic" observations (sum÷4).
  c. daily mean of highest and lowest hourly values (sum÷2).
  d. daily difference between a and b and between a and c.

(2) Dew point temperature (° F.).
  a. daily mean of 24 hourly values (sum÷24).
  b. daily mean of 4 "synoptic" observations (sum÷4).
  c. daily mean of highest and lowest hourly values (sum÷2).
  d. daily difference between a and b and between a and c.

(3) Relative humidity (percent)
  a. daily mean of 24 hourly values (sum÷24).
  b. daily mean of 4 "synoptic" observations (sum÷4).
  c. daily difference between a and b.

The daily means were rounded to one decimal to determine the daily differences which were then rounded to whole numbers. These daily differences (1d, 2d, and 3c) for each month at each station for the five years were then accumulated in a frequency table. The class intervals were 1° F. for dry bulb and dew point temperatures and 1 percent for relative humidity. Percent frequencies were computed for each class. In all cases the daily mean of the 24 hourly values was taken as the "true" mean (Conrad and Pollak [4]) from which to determine the daily departures. In addition, for each station-month, the mean departure and the standard deviation of the daily departures were determined.

These results (mean departure and standard deviation) for each comparison for each station-month are summarized in tables 1 to 5. In addition, for three of the stations, the percent frequency distribution of daily departures from the "true" mean are presented in graphical form (figs. 1, 2, and 3). For this purpose, one west coast station (San Francisco), one continental station (Bismarck), and one east coast station (Washington) were selected. In these figures, the class interval (abscissa) for dry bulb temperature and dew point is 1° F. For relative humidity, the class interval is 3 percent (See Appendix).

It was also considered desirable to examine the shape of the diurnal curves of hourly values of these elements. Average hourly temperatures (dry bulb) for a number of stations are available in the "Climatological Record" books formerly kept on station. The average curves for these four months for the same three stations are given in figures 4, 5, and 6 with the highest and lowest values shown.

Average hourly values of dew point and relative humidity are not available from this source for these stations. However, the average curves for the month of January 1961 (the first month of publication of the new *Supplement*) are presented in figures 7, 8, 9. Here the curves for all three elements are presented on the same graph to facilitate comparison.

In addition to the average monthly curves, it was of interest to examine the daily march of these elements on individual days selected to represent some departure from the average. The standard deviations in tables 1 and 2 indicate a considerable variability in the daily departures at Bismarck in January, although the average departure is very small. The frequency of air mass changes at this continental location in winter is one of the principal reasons for this large variability. Therefore, four dates in January 1961 at Bismarck were selected as examples of the types of unusual daily curves which may occur. They are presented in figure 10.

3. DISCUSSION

As stated in the introduction, a principal purpose of this study was to examine and compare several methods of computing daily mean values of dew point and relative humidity. However, to give these comparisons a "common denominator" familiar to climatologists and others accustomed to handling temperature data, the results are presented against a background of similar computations and comparisons of daily mean dry bulb temperature. These latter have been frequently studied [4, 5, 6] and the limitations of the various methods of computation are fairly well known. Therefore it was felt that by using dry bulb, dew point, and relative humidity data from the same stations for the same months and periods of record, the usefulness of the study would be greatly increased.

TABLE 1.—*Dry bulb temperature: synoptic mean vs. 24-hr. mean. Average departure of mean of 4 synoptic observations from 24-hr. mean and standard deviation of daily departures. 5 years of record, °F.*

Station	January		April		July		October	
	Dep.	S.D.	Dep.	S.D.	Dep.	S.D.	Dep.	S.D.
Seattle	+0.1	0.4	+0.2	0.5	−0.1	0.6	+0.2	0.5
San Francisco	+0.5	0.6	+0.3	0.5	+0.3	0.4	+0.4	0.6
Salt Lake City	+0.3	1.1	+0.3	1.1	−0.3	1.0	+0.6	1.2
Bismarck	+0.1	1.4	0	1.1	−0.2	0.9	0	1.3
Fort Worth	0	1.1	−0.1	1.1	−0.1	0.7	−0.2	0.9
St. Louis	0	1.3	−0.2	1.1	−0.1	0.8	−0.3	1.0
Boston	0	0.7	−0.1	0.7	0	0.7	−0.2	0.6
Washington	−0.1	0.7	−0.2	0.8	0	0.5	−0.2	0.6
Miami	−0.4	0.7	−0.4	0.6	−0.2	0.7	−0.4	0.6

TABLE 2.—*Dry bulb temperature: mean of high/low vs. 24-hr. mean. Average departure of mean of highest and lowest hourly from 24-hr. mean and the standard deviation of daily departures. 5 years of record, °F.*

Station	January		April		July		October	
	Dep.	S.D.	Dep.	S.D.	Dep.	S.D.	Dep.	S.D.
Seattle	+0.1	0.8	+0.2	0.9	+0.4	1.1	+0.3	0.9
San Francisco	+1.0	1.0	+0.8	1.1	+1.7	1.0	+1.5	1.3
Salt Lake City	+0.5	1.4	0	1.3	−0.9	1.3	+0.6	1.3
Bismarck	+0.1	1.9	−0.1	1.3	−0.1	1.3	+0.9	1.6
Fort Worth	+0.4	1.6	+0.1	1.2	+0.2	1.0	+0.1	1.0
St. Louis	−0.1	1.3	+0.1	1.3	+0.2	1.0	+0.4	0.9
Boston	0	1.4	+0.6	1.2	+0.4	1.1	+0.1	1.1
Washington	+0.4	1.1	+0.2	1.2	+0.3	1.1	+0.4	0.9
Miami	+0.1	2.1	+0.1	0.8	+0.3	1.0	+0.4	0.8

DRY BULB TEMPERATURE

Tables 1 and 2 present the results of comparing daily mean temperatures computed from the four synoptic observations and from the daily highest and lowest hourly readings with the "true" 24-hour mean. The computations are based on five years of record for each station-month. The first column under each month lists the average daily departure from the "true" mean. The second column presents the standard deviation of the daily departures. When the average departures and standard deviations in table 1 are compared with those in table 2, a measure of the relative reliability of these two short-cut methods is disclosed. In table 1 there are only 2 cases in which the average departure (ignoring sign) equals or exceeds 0.5° F., while in table 2 there are 9 such cases. In table 1, only 10 out of 36 (26 percent) of the standard deviations exceed 1.0° F., while in table 2, 23 out of 36 (64 percent) of them are

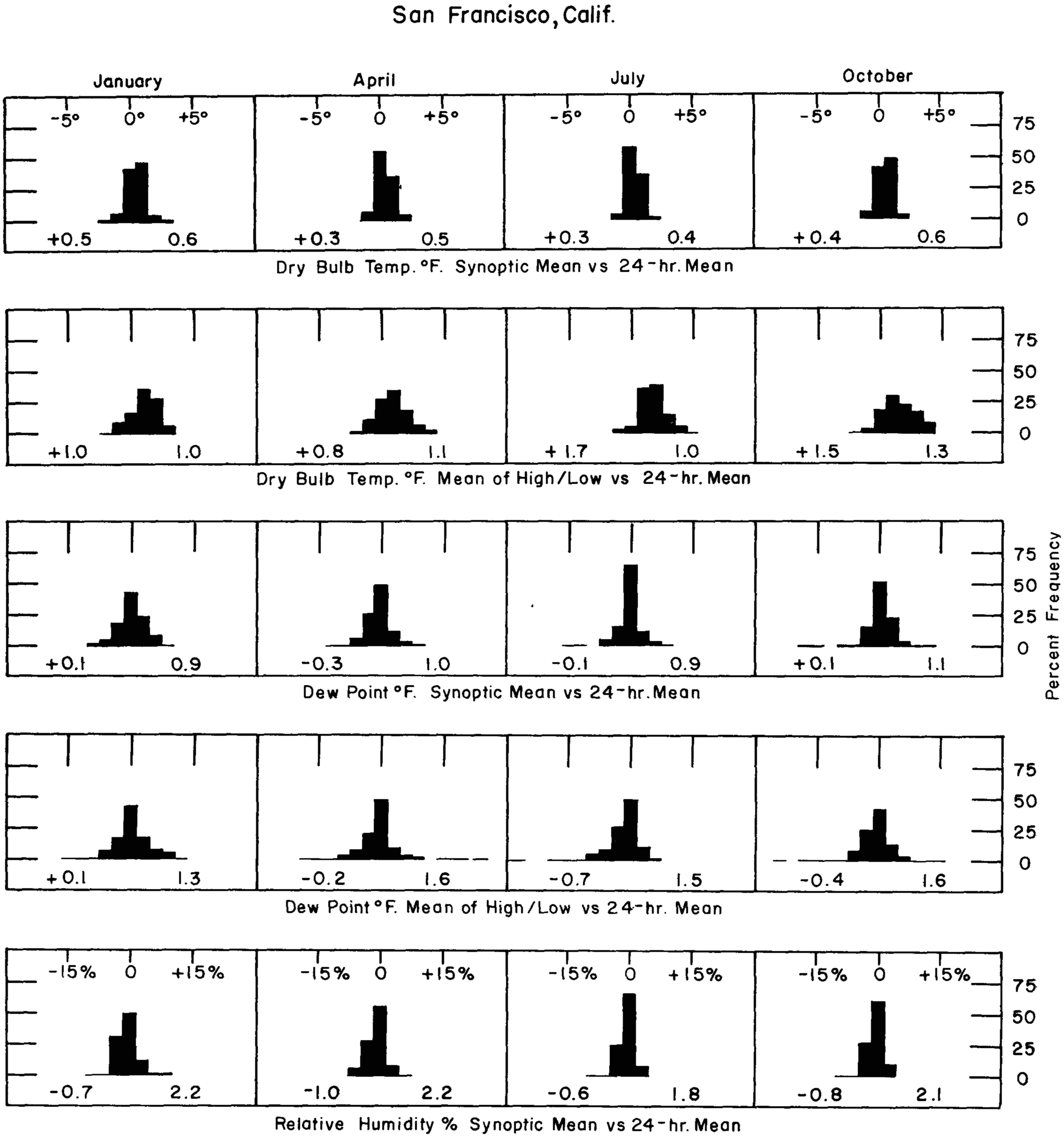

Figure 1.—The average of the daily departures from the 24-hour mean, and the frequency distribution and standard deviations of those daily departures for dry bulb temperature, dew point temperature, and relative humidity at San Francisco, Calif. for 5 years of data (1955–59). "Synoptic mean" indicates the daily average of the values recorded at the 4 "synoptic" observations. "Mean of high/low" is the daily average of the highest and lowest hourly values.

larger than unity. None of the standard deviations in table 1 exceeds 1.5° (1.4° in January at Bismarck is the largest) while in table 2 there are 4 cases which exceed 1.5°.

Bigelow [5] used hourly temperature data from 25 stations for an 11-year period (1891–1901) to obtain average corrections to reduce means computed by various combinations to "true" 24-hour means. He plotted these

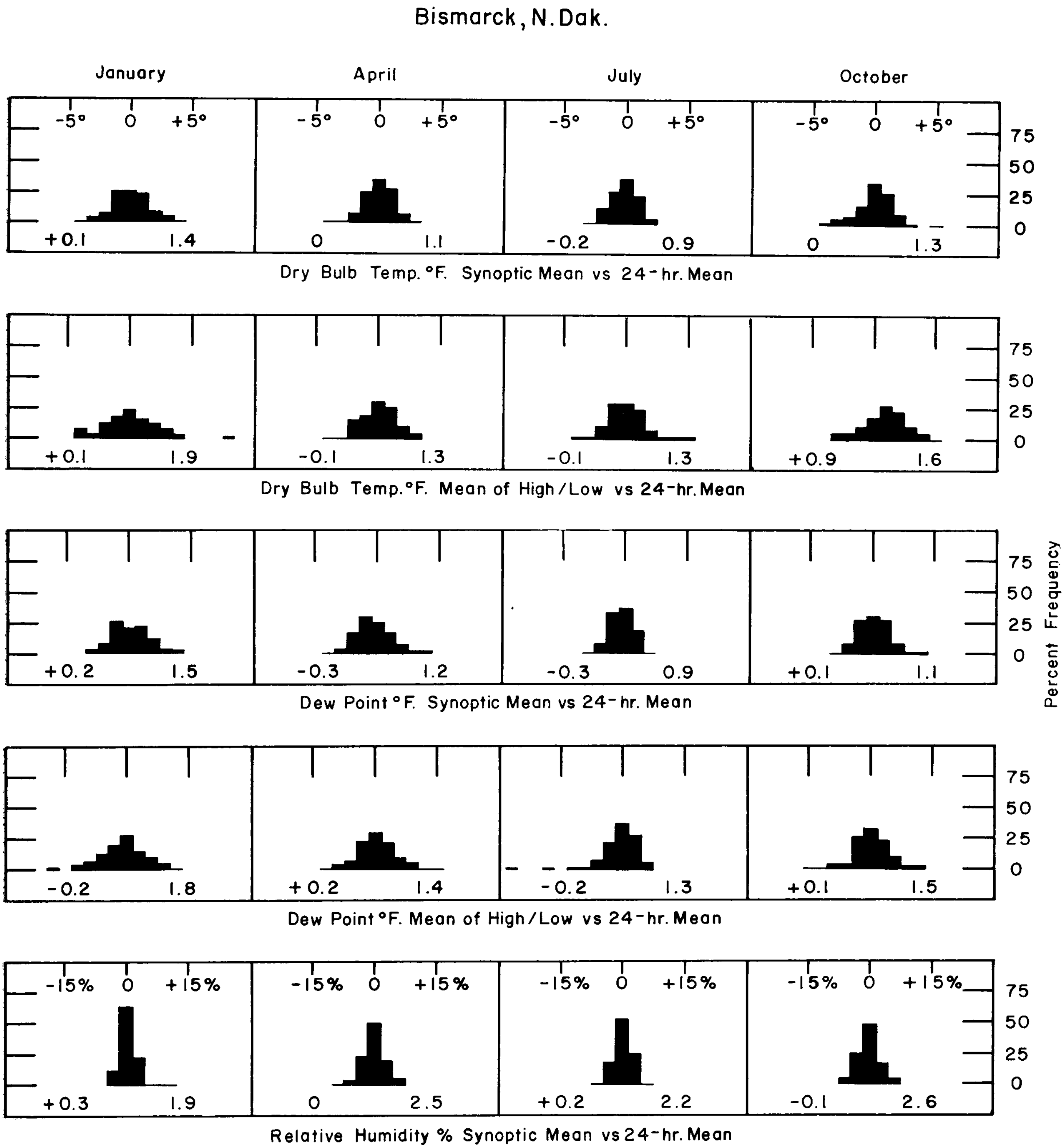

Figure 2.—The average of the daily departures from the 24-hour mean, and the frequency distribution and standard deviation of those daily departures for dry bulb temperature, dew point temperature, and relative humidity at Bismarck, N. Dak. for 5 years of data (1955–59).

corrections on maps for each month, drew isolines, and interpolated correction terms for a considerable list of stations. His corrections (with sign reversed to make them comparable to the departures presented in this study) for a list of stations and months comparable to those of this study are given in table 6, column A. Corresponding values from the present study (taken from table 2) are listed for comparison. It was recognized

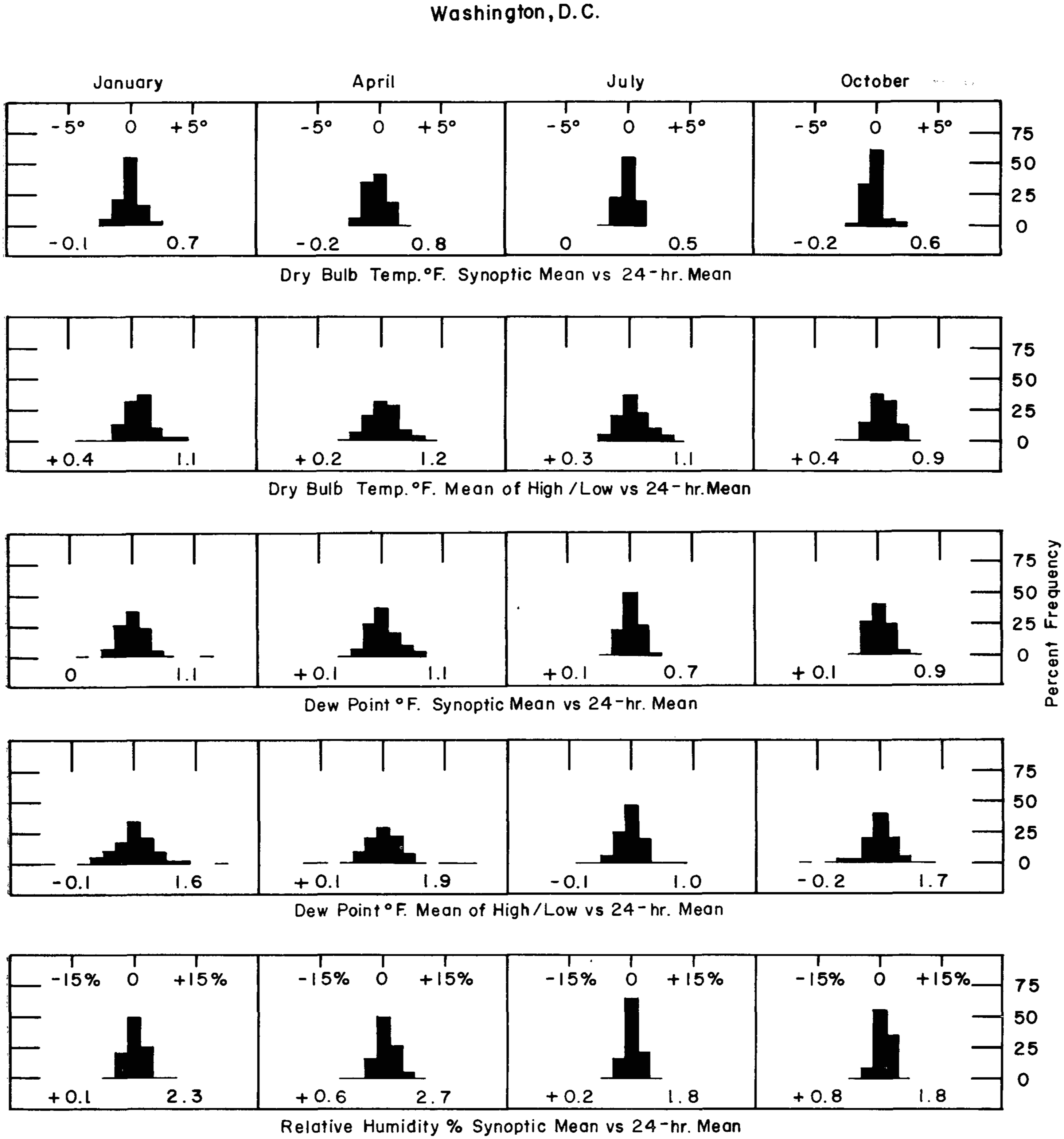

Figure 3.—The average of the daily departures from the 24-hour mean, and the frequency distribution and standard deviation of those departures for dry bulb temperature, dew point temperature, and relative humidity at Washington, D.C. for 5 years of data (1955–59).

that changes in station location or other changes during the intervening half-century may have introduced reasons for differences between results of the two studies. However, it was considered that a historical comparison would be of some interest. There is good agreement between the two sets of data in the cases of larger departures. See, for example, San Francisco in April, July, and October. In most other cases the sign and magnitude of the departures are in fair agreement. There are only a few large contradictions, the most obvious being at Salt Lake City in April and October and at Bismarck in January.

TABLE 3.—*Dew point: Synoptic mean vs. 24-hr. mean. Average departure of mean of 4 synoptic observations from 24-hr. mean and the standard deviation of daily departures. 5 years of record, °F.*

Station	January		April		July		October	
	Dep.	S.D.	Dep.	S.D.	Dep.	S.D.	Dep.	S.D.
Seattle	0	0.7	+0.1	0.7	0	0.6	+0.1	0.6
San Francisco	+0.1	0.9	−0.3	1.0	−0.1	0.9	+0.1	1.1
Salt Lake City	+0.2	1.2	−0.3	1.1	−0.3	1.3	−0.1	1.1
Bismarck	+0.2	1.5	−0.3	1.2	−0.3	0.9	+0.1	1.1
Fort Worth	0	1.4	−0.1	1.6	−0.1	0.7	0	1.1
St. Louis	0	1.5	−0.1	1.1	0	0.7	0	1.1
Boston	0	1.1	0	0.9	0	0.6	0	0.9
Washington	0	1.1	+0.1	1.1	+0.1	0.7	+0.1	0.9
Miami	−0.1	0.8	+0.1	0.6	+0.1	0.5	0	0.5

TABLE 4.—*Dew point: Mean of high/low vs. 24-hr. mean. Average departure of mean of highest and lowest hourly from 24-hr. mean and the standard deviation of daily departures. 5 years of record, ° F.*

Station	January		April		July		October	
	Dep.	S.D.	Dep.	S.D.	Dep.	S.D.	Dep.	S.D.
Seattle	−0.3	1.0	−0.5	1.2	−0.2	0.8	−0.2	0.8
San Francisco	+0.1	1.3	−0.2	1.6	−0.7	1.5	−0.4	1.6
Salt Lake City	−0.2	1.4	−0.2	1.3	−0.5	1.5	+0.1	1.0
Bismarck	−0.2	1.8	+0.2	1.4	−0.2	1.3	+0.1	1.5
Fort Worth	0	1.7	+0.1	2.3	−0.4	0.8	−0.3	1.6
St. Louis	−0.1	1.6	0	1.4	−0.1	0.8	−0.1	1.2
Boston	−0.1	2.1	+0.2	1.5	0	1.0	+0.1	1.6
Washington	−0.1	1.6	+0.1	1.9	−0.1	1.0	−0.2	1.7
Miami	−0.3	1.1	−0.5	1.2	−0.3	0.6	−0.2	0.7

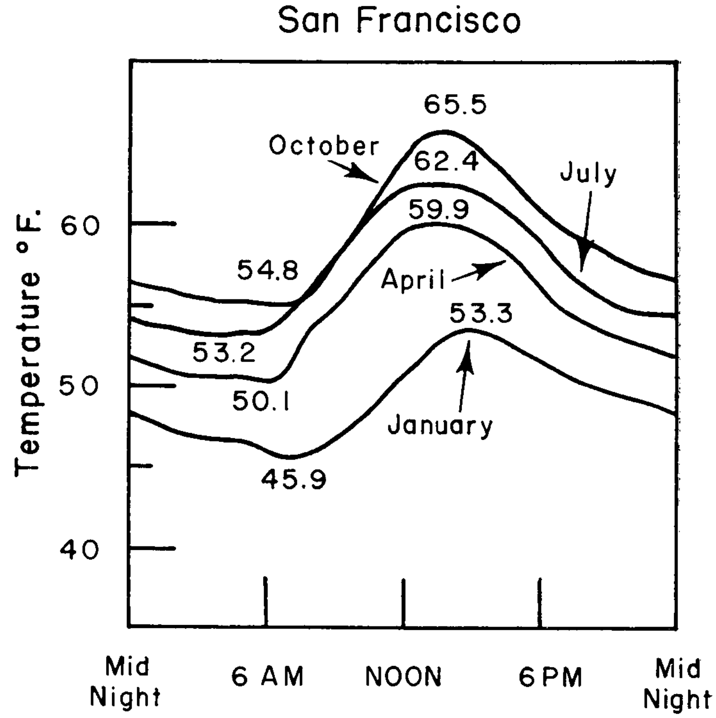

FIGURE 4.—Mean hourly temperature for selected months (1891–1930), San Francisco, Calif.

A comparison of the average departures and standard deviations of corresponding individual station months between table 1 and table 2 shows that in every case either one or both are larger in table 2 than in table 1. This merely serves to substantiate the work of others regarding the mean of the daily maximum and minimum. The present purpose is not to make a case either for or against one of these methods but rather to determine whether or not daily mean values of dew point and relative humidity by one or the other of these methods are as reliable, by comparison, as are daily mean values of temperature.

DEW POINT TEMPERATURE

Tables 3 and 4 present the averages and the standard deviations of the daily departures of daily mean dew points computed and listed in the same way as were the temperature data in tables 1 and 2. Dew point is generally considered to be a much more conservative element than is dry bulb temperature. This conservatism may be responsible for the generally smaller average departures from the "true" daily mean. In table 3 (mean of four synoptic observations) the greatest monthly average departure is 0.3°, while in table 1 (dry bulb by the same method) there were 2 cases of 0.5° or greater. In table 4 (mean of daily highest and lowest hourly) there are 3 cases of average departure of 0.5° or greater (the largest being 0.7°), while in the corresponding table 2 (for dry bulb temperature) there are 9 cases of average departures of 0.5° or greater with an extreme of 1.7°. In other words, so far as average departure is concerned, each of the two methods (synoptic mean and mean of high and low) has less departure when used for dew point than when used for dry bulb. Also, as in the case of dry bulb, the departures of means obtained from the sum of the daily highest and lowest hourly observations (table 4) tend to be slightly larger than those obtained from the four synoptic observations (table 3).

Before discussing the practical significance of the standard deviations in tables 3 and 4 (compared with those in tables 1 and 2) it is in order to examine the units involved. The reasons for adopting a class interval of 3 percent relative humidity in figures 1, 2, and 3 are discussed in the Appendix. A similar examination of the psychrometric tables was made to determine whether or not, for the purposes of this study, a unit of 1° F. in dry bulb temperature could reasonably be compared to a unit of 1° F. in dew point temperature. It was found that at temperatures near or above freezing, when the corresponding relative humidity is 50 percent or higher, a change of 1° F. in the dry bulb is accompanied by a corresponding change (at a fixed relative humidity) of only slightly more than 1° F. in the dew point. At high temperatures and relative humidities the 1:1 ratio is almost exact. In the vicinity of 60° F. at 50 percent relative humidity the ratio is about 1:1.2. In the range 20° F. to 40° F. at 50 percent relative humidity the ratio averages a little higher, about 1:1.4, and increases rapidly at lower temperatures and lower relative humidities. That is, at lower temperatures and lower relative humidities, a change of 1° F. in the dry bulb is comparable to a change of from 2° F. to several degrees in the dew point temperature. Therefore, for the practical purposes of this present study, the magnitude of the average departures and standard deviations in tables 3 and 4 may be considered generally comparable with

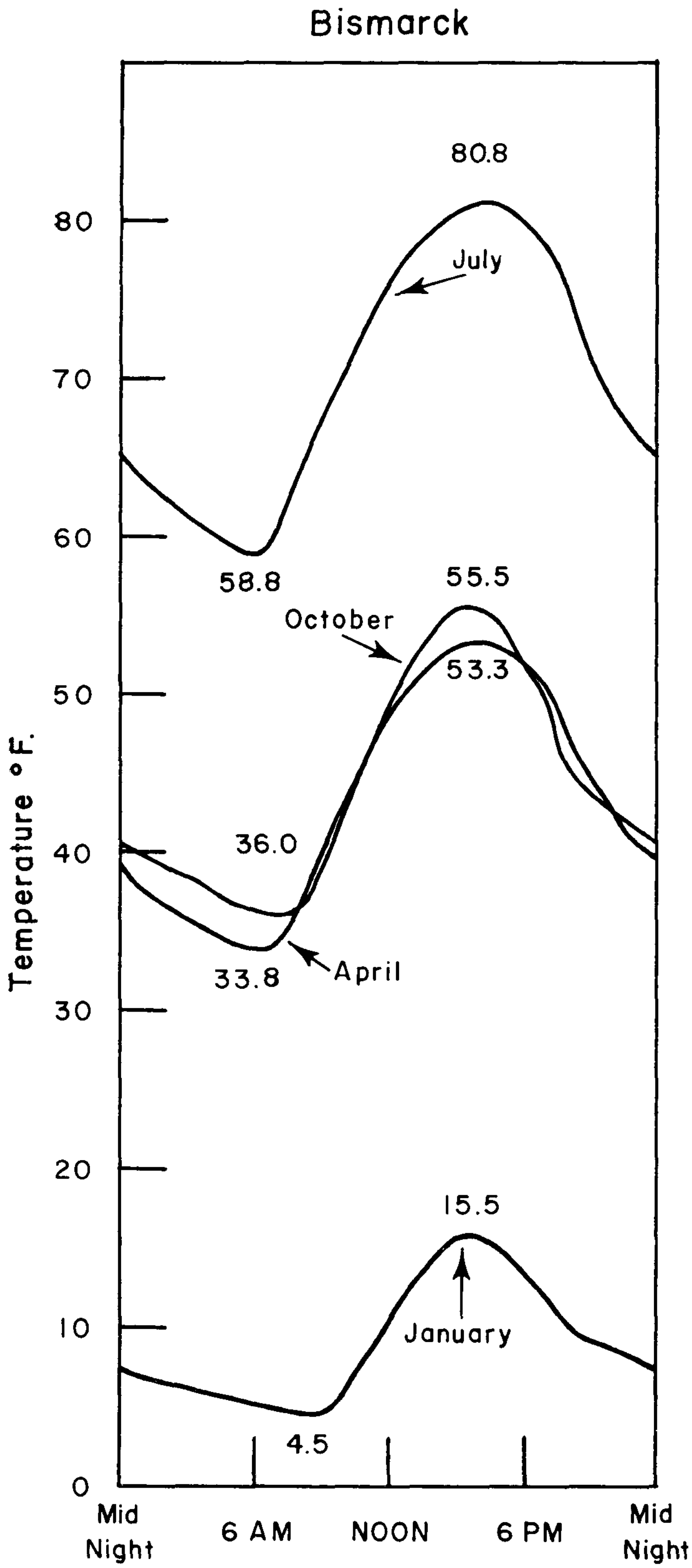

FIGURE 5.—Mean hourly temperature for selected months (1894–1930), Bismarck, N. Dak.

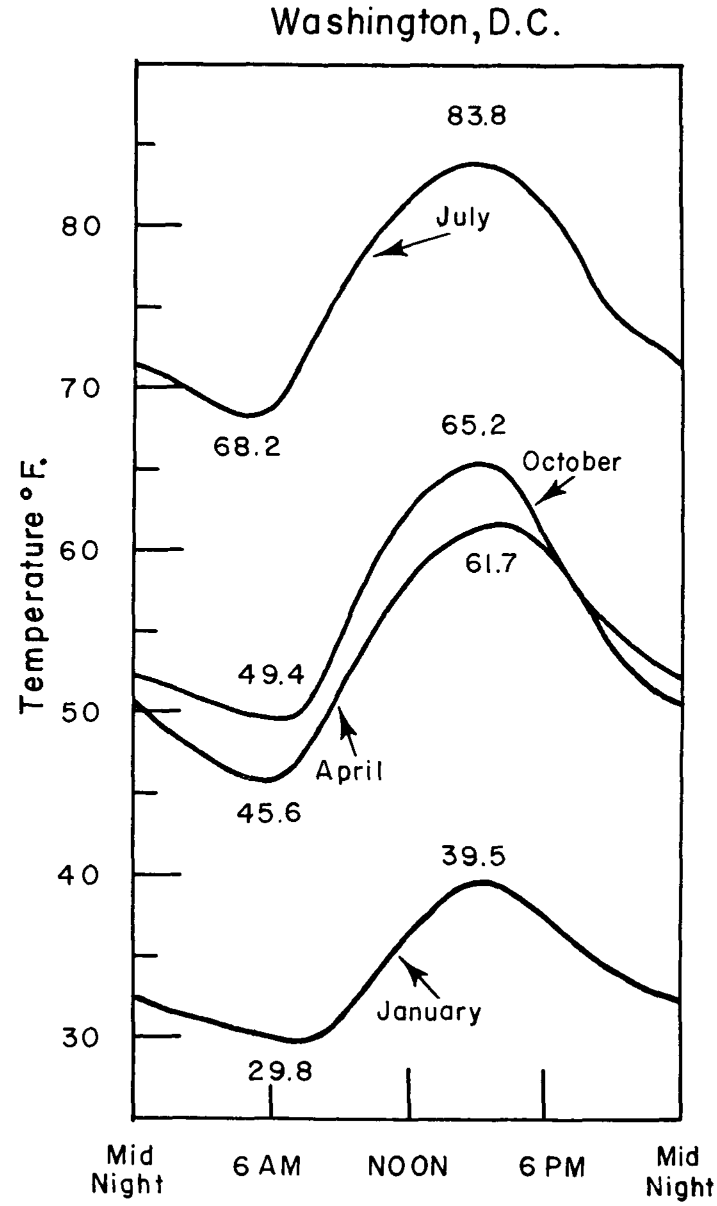

FIGURE 6.—Mean hourly temperature for selected months (1890–1930), Washington, D.C.

those in tables 1 and 2 except in months with high frequencies of daily mean temperatures near or below about 20° F. or with daily mean relative humidities below 50 percent. In the present study only the January data for Salt Lake City, Bismarck, St. Louis, and Boston would be affected, and these only marginally. The following discussion will proceed on the basis that the comparisons are valid with the exceptions just mentioned.

A comparison of the standard deviations in tables 1 and 3 shows that in January at all stations the standard deviations are larger in the case of dew point (table 3) than in the case of dry bulb (table 1). However, the increases are not large and may be due in part to the effect of low winter temperatures discussed in the preceding paragraph. In April there is a tendency toward only slightly larger standard deviations in table 3, while in July and October there are actually a few decreases in table 3.

A similar comparison between tables 2 and 4 shows very much the same tendency. In January most stations show a small increase, although at Miami the reverse is true with a large decrease (from 2.1 to 1.1) in the standard

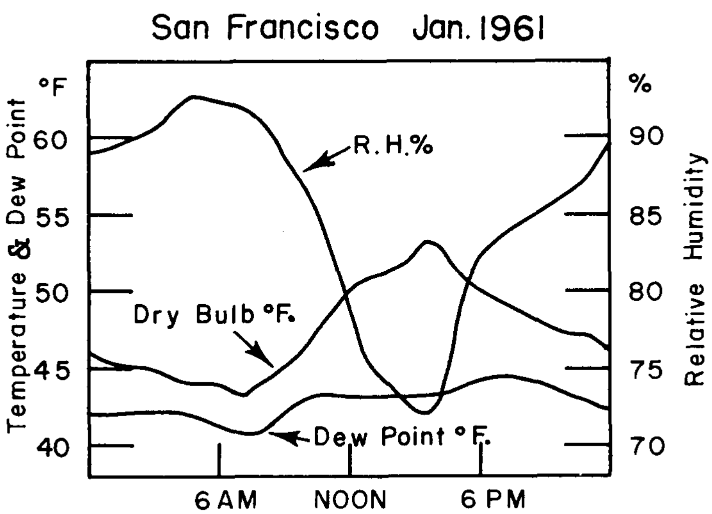

FIGURE 7.—Mean hourly values of temperature, dew point, and relative humidity for January 1961 at San Francisco, Calif.

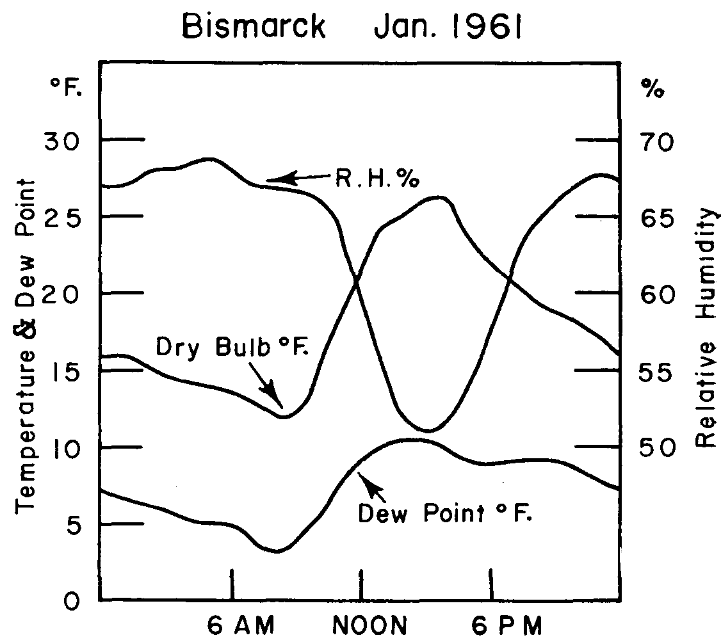

FIGURE 8.—Mean hourly values of temperature, dew point, and relative humidity for January 1961 at Bismarck, N. Dak.

deviation. In April (table 4) the standard deviation at Fort Worth of 2.3° F. is the largest in tables 1, 2, 3, and 4. In July, only two stations show a larger standard deviation in table 4 than in table 2, one shows no change, while six show a smaller value in table 4. In summary, the following numbers of standard deviations in excess of the indicated limits in each of these tables gives some measure of the relative usefulness of these methods when applied to dry bulb and when applied to dew point:

	Standard deviation >1	>1.5	>2
Table 1	10	0	0
Table 3	17	1	0
Table 2	23	4	1
Table 4	26	12	2

Briefly, then, it can be said that average departures are slightly smaller and standard deviations slightly larger in tables 3 and 4 than in tables 1 and 2. The larger standard deviations might be expected in part because of the relationship of temperature and dew point at low temperatures and low relative humidities.

RELATIVE HUMIDITY

Relative humidity is a bilaterally limited element ([4], pp. 43–46). That is, it has both an upper (100 percent) and lower (0 percent) limit. In many climates and seasons the 100 percent upper limit is frequently approached or reached. For these reasons there are no known plans to compute daily means based on daily maximum and minimum values. However, the mean of the four synoptic observations has been used by several workers as an estimate of the daily mean. This present study is limited to a comparison of daily means computed from the 24 hourly values with those computed from the four synoptic observations. The relative significance of a change of 1° F. in dry bulb temperature and a change of 1 percent in relative humidity is discussed in the Appendix; it indicates that as a conservative estimate a

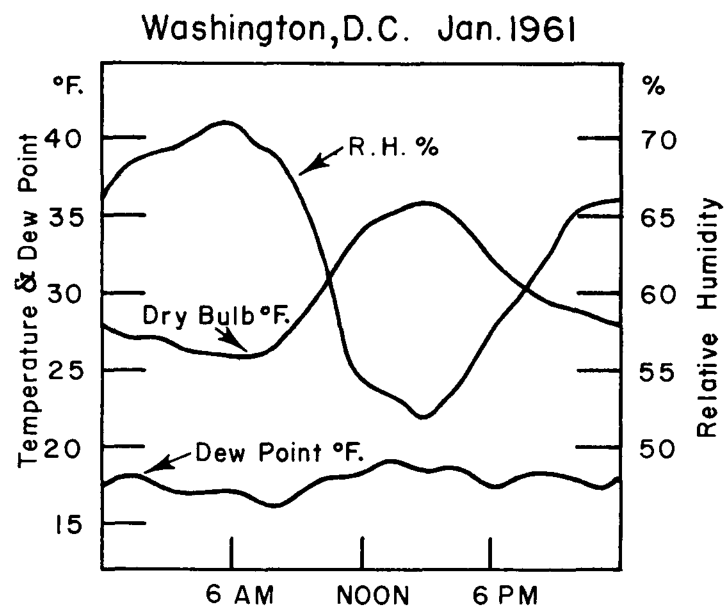

FIGURE 9.—Mean hourly values of temperature, dewpoint, and relative humidity for January 1961 at Washington, D.C.

TABLE 5.—*Relative humidity: Synoptic mean vs. 24-hr. mean. Average departure of mean of 4 synoptic observations from 24-hr. mean and the standard deviation of daily departures. 5 years of record, percent*

Station	January		April		July		October	
	Dep.	S.D.	Dep.	S.D.	Dep.	S.D.	Dep.	S.D.
Seattle	0	2.1	−0.2	2.0	+0.2	1.8	−0.4	1.8
San Francisco	−0.7	2.2	−1.0	2.2	−0.6	1.8	−0.8	2.1
Salt Lake City	−0.2	2.7	−0.5	2.9	+0.5	2.1	−1.3	2.9
Bismarck	+0.3	1.9	0	2.5	+0.2	2.2	−0.1	2.6
Fort Worth	−0.2	2.1	−0.1	3.2	+0.2	1.9	+0.3	2.1
St. Louis	−0.1	2.4	+0.2	2.9	+0.3	1.8	+0.4	2.5
Boston	+0.2	2.0	+0.3	2.3	0	1.8	+0.7	1.7
Washington	+0.1	2.3	+0.6	2.7	+0.2	1.8	+0.8	1.8
Miami	+0.8	1.9	+1.1	1.9	+0.8	1.9	+1.2	1.8

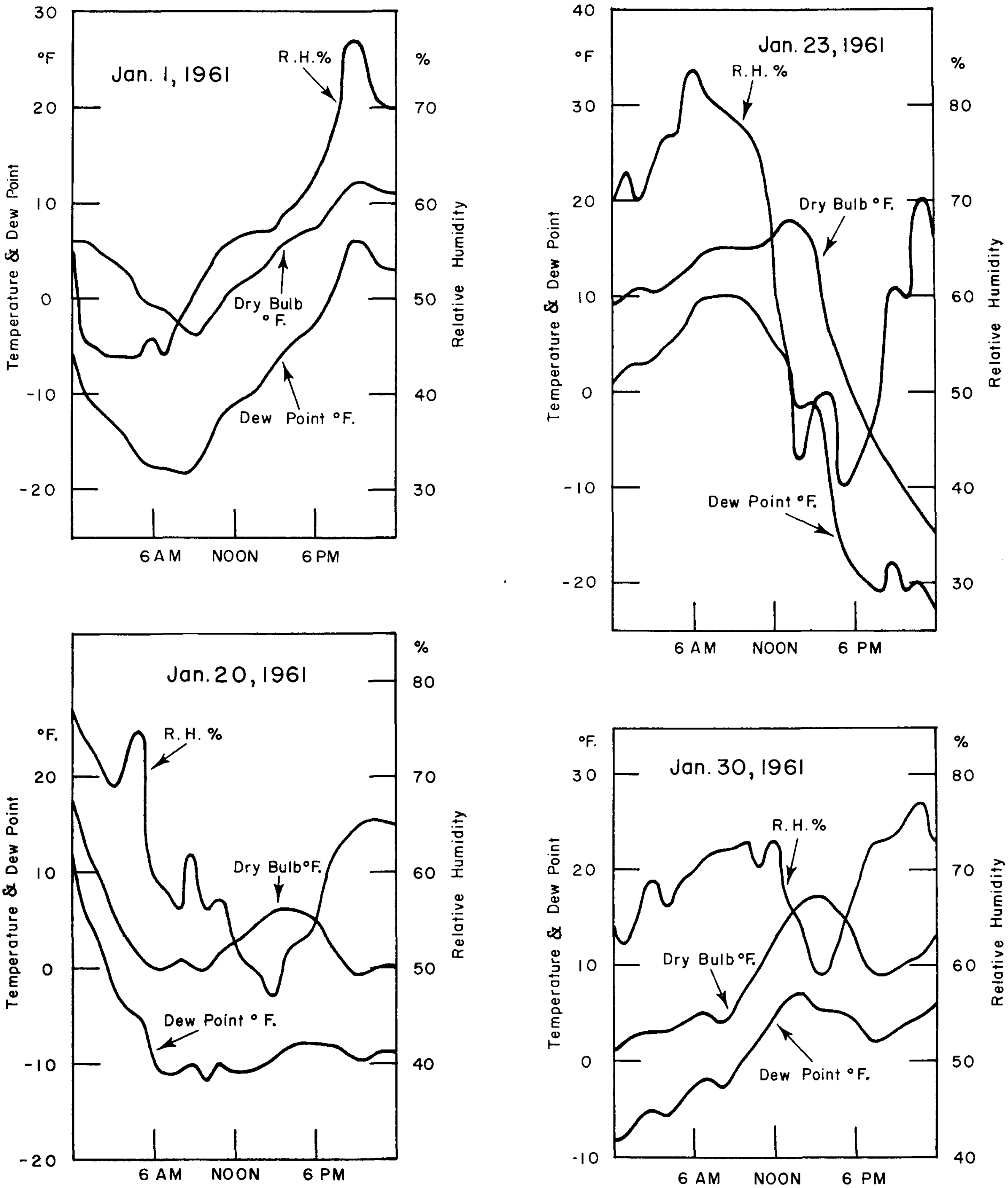

FIGURE 10.—Daily march of dry bulb and dew point temperature and relative humidity for selected dates in January 1961 at Bismarck, N. Dak.

unit of 3 percent relative humidity is comparable, for these purposes, with a unit of 1° F.

Table 5 lists the average departures and standard deviations of daily departures of daily mean relative

TABLE 6.—*Dry bulb temperature (°F.). Average departure of mean of highest and lowest hourly from 24-hr. mean: Column A according to Bigelow [5], and Column B according to this study, table 2.*

Station	January		April		July		October	
	A	B	A	B	A	B	A	B
Seattle	+0.5	+0.1	+0.5	+0.2	+0.5	+0.4	+0.8	+0.3
San Francisco	+0.4	+1.0	+1.0	+0.8	+1.3	+1.7	+1.4	+1.5
Salt Lake City	+0.3	+0.5	−0.5	0	−1.0	−0.9	−0.1	+0.6
Bismarck	−0.5	+0.1	+0.3	−0.1	−0.2	−0.1	+0.7	+0.9
Fort Worth	+0.3	+0.4	+0.3	+0.1	+0.4	+0.2	+0.3	+0.1
St. Louis	+0.2	−0.1	+0.3	+0.1	+0.2	+0.2	+0.5	+0.4
Boston	−0.2	0	+0.5	+0.6	+0.5	+0.4	+0.4	+0.1
Washington	+0.1	+0.4	−0.1	+0.2	+0.5	+0.3	+0.3	+0.4
Key West	+0.2	--------	+0.2	--------	−0.1	--------	0	--------
Miami	--------	+0.1	--------	+0.1	--------	+0.3	--------	+0.4

humidities computed by two methods. The "true" daily mean is the average of the 24 hourly values. The other is the mean of the 4 synoptic observations. The values are expressed in units of percent relative humidity. They should be divided by 3 to be comparable to the dry bulb temperature data in tables 1 and 2. On this basis the largest average departure in table 5 (−1.3 percent at Salt Lake City in October) is appreciably smaller than any in table 1 and falls far short of the largest in table 2 (+1.7 at San Francisco in July). Similarly, in all cases the individual station-month values in table 5 are either smaller than or roughly comparable to their counterparts in tables 1 and 2.

In the case of standard deviations of daily departures, a similar comparison shows very little difference between tables 1 and 5. About two-thirds of the corresponding individual values are larger in table 1 than in table 5 but the differences are small. The largest single value in table 1 is 1.4° F. at Bismarck in January and in table 5 it is 3.2 percent at Fort Worth in April. On a 3 to 1 basis the 3.2 percent is comparable to, but smaller than the 1.4° F.

4. CONCLUSIONS

The purpose of this study was to compare certain methods of computing daily mean values of dew point and relative humidity with similar computations of daily mean dry bulb temperature. The comparisons which were made permit the following generalizations:

1. Daily mean dew point temperatures computed from the four synoptic observations do not vary from the "true" mean any more than daily mean dry bulb temperatures computed in the same way.

2. Daily mean dew point temperatures computed from the daily highest and lowest hourly values do not vary from the "true" mean any more than daily mean dry bulb temperatures computed in the same way.

3. Daily mean dew point temperatures computed from the four synoptic observations vary less from the "true" mean than those computed from the daily highest and lowest hourly values. The difference between the two methods is about the same for dew point as it is for dry bulb temperature.

4. Daily mean relative humidities computed from the four synoptic observations vary less from the "true" mean than daily mean dry bulb temperatures computed from either the four synoptic observations or from the daily maximum and minimum.

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APPENDIX

The original frequency distribution computations for relative humidity were based on class intervals of one percent. For graphical representation, this interval was too small and gave a very flat distribution which could not be compared with the temperature distribution.

It was decided to consider a larger class interval, one comparable in physical meaning to a temperature unit of 1° F. Relative humidity is of interest in evaporation problems as a means of estimating vapor pressure deficit [1, 2]. Therefore, a unit of relative humidity was sought which would correspond to 1° F. so far as their respective relation to changes in vapor pressure is concerned. The following approximate equivalents were taken from standard psychrometric tables as the amount that the vapor pressure would change with a change of 1° F. temperature or with a change of 1 percent relative humidity.

At this temperature:	*A change of 1° F. corresponds to a change in vapor pressure of:*	*A change of 1 percent relative humidity corresponds to a change in vapor pressure of:*	*Ratio*
20° F.	0.005 inch	0.001 inch	5 to 1
40° F.	0.010 inch	0.0025 inch	4 to 1
60° F.	0.018 inch	0.005 inch	3½ to 1
80° F.	0.033 inch	0.010 inch	3 to 1

From these relationships it was apparent that a class interval for relative humidity in the range of 3, 4, or 5 percent would compare well with a class interval for temperature of 1° F. To make best use of the limited amount of data available, it was decided to use a class interval of 3 percent in these graphs. Following the same line of reasoning, a standard deviation of daily departure of mean relative humidity of 3 percent may be considered to be roughly comparable to a standard deviation of daily departure of mean temperature of 1° F.